Method for Operating a Manure Transport Device

The invention relates to a method and a device for operating a manure transport device for livestock breeding operations according to the preamble of claim 1 and the preamble of claim 6.

Manure transport devices for livestock breeding operations, which devices comprise a manure conveyor belt driven in a circulating manner arranged underneath a stall floor and which have a return roller, are known, e.g., from DE 195 14 574 C1. This known device is suitable for poultry breeding operations, whereby poultry excrete a relatively solid but moist manure in which a separation of manure and urine is not possible.

With the device according to DE 195 14 574 C1, the problem arises that planar textile structures can be guided as conveyor belts only with great difficulty, but they always have the tendency to slip from the drive and return rollers due to the fact that the textile structure does not allow a trouble-free guiding of the belt. With this known device, the straight course of the belt has been ensured in that the return roller is likewise driven and always has a higher rotational speed than the drive roller, experiments having shown that this arrangement makes possible a trouble-free guiding of the manure conveyor belt.

US 3,119,373 describes a demanuring cleansing arrangement in which an inclined plane preferably covered by plastic sheets is formed beneath a grating forming the stall of the stable animals on which plane a pusher can glide which can be moved over the inclined plane by a motor with the aid of a chain and roller drive. In order to maintain the conveyor device for this dung pusher constantly under tension, a tensioning device in the form of a spring is arranged at one of the two rotating shafts, in particular that for the roller that is not driven, the spring acting on the bearing of the rotating shaft. Although the return roller is supported in a floating manner here, this is not a driven return roller.

With livestock breeding operations in which animals are kept that excrete solid manure and liquid urine, e.g., pigs, considerable difficulties arise in carrying away this very moist, mushy mixture. Although a manure removal arrangement for

small-animal farms is known, for example, from DE 35 28 604 A1, which arrangement has a two-part design, namely comprising on the one hand a liquid-tight floor part which serves as a urine collection channel, a fall-through grating being arranged above this liquid-tight floor channel. This fall-through grating is formed by a conveyor assembly or conveyor belt that does not display in a circulating manner an upper and a lower belt half, but is rather composed of a single layer of a moisture-permeable material, which layer can, for example, be a mesh-like textile.

The use of such an arrangement in the case of swine breeding operations would not be successful, since the solid manure involved here is still relatively soft and would fall through the fall-through grating.

If conveyor belts are used in swine breeding operations for the removal of the manure, a very quick fouling of the actual return rollers occurs so that the conveyor belts slip off laterally. Likewise, the attempt in practice to embody the drive roller and/or the return roller in a convex manner in order to thus achieve a straight course of the conveyor belt, has not been successful because the fouling is too great and the solid manure components equalize the convexity of the return roller and drive roller.

The attempt to design the return roller and/or drive roller as latticed rollers in order to thus achieve an appropriate guidance, has not been successful, either, since these rollers inside the lattice then become clogged extremely quickly.

A method is known from US 2005/0028748 A1 in which the return roller can be shifted in the longitudinal axis of the manure conveyor belt and is acted upon by an adjustment device through which a tensioning of the manure conveyor belt is regulated, the adjustment device producing the tension on the manure conveyor belt being intermittently active. It has hereby also been proposed to drive the return roller in the direction opposite to that of the drive roller. This known device has proven itself in practice but is very expensive in constructional terms.

The object of the invention is to create a manure conveying device for livestock breeding operations in which a separation of manure and urine occurs, in which

the straight course of the belt is guaranteed despite substantial fouling, furthermore a cleaning of the return rollers takes place, whereby furthermore this device is to be manufactured and operated very cost-effectively.

This object on which the invention is based is attained through the teaching of claim 1.

Advantageous embodiments of the method according to the invention are explained in subordinate claims 2 through 5.

In other words, a method for a manure conveyor belt is proposed which is guided around two drive rollers – the front and the rear drive roller. Both drive rollers are driven intermittently, but run at different speeds. Thus, for example, the front drive roller is driven temporarily for a period of a few minutes rotating more quickly than the rear drive roller and after a certain rest period, i.e., stoppage of the belt, the rear return roller is driven more quickly than the front one, whereby this switching can be accomplished most simply by a frequency controller, but can also be controlled by other electronic or electric devices.

The roller respectively driven more quickly in a circulating manner runs more quickly than the actual manure conveyor belt and through the friction occurring between the roller and the underside of the belt, a cleaning of the belt, a cleaning of the roller takes place and – which is very important – at the same time the belt has the possibility of returning again to the straight course if it has drifted out of the straight course.

The rotational speed of the two rollers is very low. For example, the return roller driven more quickly circulates at a rotational speed of 1.5 rpm, while the return roller driven respectively more slowly is driven at a rotational speed of 1 rpm.

The invention then further relates to a manure conveyor device for livestock breeding operations according to the preamble of claim 6.

Advantageous embodiments of this manure conveyor device are explained in subordinate claims 7 through 15.

In other words, a moisture-permeable manure conveyor belt is proposed, to which a manure collection channel is assigned at one end, namely to the upper belt half, a urine collection channel being assigned to the other end, namely the lower belt half. The lower belt half thereby circulates in a moisture-tight trough and the lower belt half conveys the collecting urine away to the urine collection channel.

Due to the slow rotational speed of the actual conveyor belt, the manure already dries on the upper belt half and is thus transferred to the manure collection channel in a relatively solid, almost dry condition.

The actual manure conveyor belt preferably comprises a perforated plastic belt, whereby the size and type of the perforation depend on the case of application.

The return rollers are made of stainless steel, so that it is possible to add acids to the urine in order to thus avoid ammonia losses. The trough in which the lower belt half runs is preferably formed by a corresponding plastic sheet, which has the advantage on the one hand of being absolutely leak-proof, on the other hand of having a high sliding ability so that the lower belt half, thus the actual belt, can slide on this sheet without difficulty.

In the simplest manner the trough is formed by lateral concrete strips that are preferably embodied inside plastic wall elements. These wall elements serve on the one hand with their base as support for the lower belt half of the manure conveyor belt, on the other hand the inclined roof surface has the advantage that a conveying of the manure towards the belt can take place here, and finally these wall elements are non-corroding.

The wall elements comprise individual sheets that seen in the longitudinal direction are connected among themselves to one another in that eyelets are formed in the rear walls of these sheets into which eyelets corresponding stabilizing wires or bars can be inserted. However, at the same time, these wall elements lying opposite one another are also connected to one another by perforated sheet metal elements so that a solid construction is created.

Bearing rods are embedded in these wall elements and in the cement strips, which rods support the upper belt half of the manure conveyor belt.

In conclusion it should therefore be noted that through the proposal according to the invention a manure transport device is achieved that on the one hand ensures a separation of urine and solid manure, whereby the manure is transferred to the manure collection channel well dried. At the same time, a continuous conveyance of the manure and urine occurs, which ensures that a good stall climate is achieved, i.e., a high air quality. Irrespective of these advantages, it is moreover achieved that, despite considerable fouling, the belt is always kept on a straight course and that a continuous cleaning of the return rollers takes place. Since at least one return roller is embodied to be tensioned, it is also achieved that the plastic belt can always be kept sufficiently tensioned, irrespective of the temperatures and loads prevailing in the stall.

An exemplary embodiment of the invention will be explained below on the basis of the drawings. The drawings thereby show:

Fig. 1 A side view of a wall construction according to the invention

Fig. 2 A section according to the line 2-2 in Fig. 1, and

Fig. 3 On a larger scale a view of several combined wall elements to accommodate the cement strips.

Fig. 1 shows a manure transport device 25 that features a manure conveyor belt 1 which comprises, e.g., a perforated plastic belt that is guided around return rollers 2 and 3 so that an upper belt half 4 and a lower belt half 5 are formed. The upper belt half 4 rests on bearing shafts 20 and the lower belt half 5 rests on a plastic sheet lying on the base 8, so that a good sliding ability of the plastic belt on the plastic sheet of the base is ensured here. This is not shown in this way for reasons of clarity in the drawing according to Fig. 1. The return roller 3 is supported in an adjustable manner, i.e., so that it can be tensioned, via a tensioning device 18. It is thus possible to keep the plastic belt 1 always equally tensioned constantly irrespective of prevailing temperature conditions. The

tensioning device 18 can work mechanically, hydraulically or pneumatically and can be controlled automatically or individually.

Electric motors 27 and 26 are assigned to the return rollers 2 and 3, i.e., both return rollers 2 and 3 are motor-driven. The manure conveyor belt 1 comprises a perforated plastic belt and at least the lower belt half 5 runs in a trough 9 that is limited by side walls 10 and 11.

In the exemplary embodiment shown, a manure collection channel 6 is assigned to the return roller 2 and the upper belt half 4 when the manure conveyor belt 1 circulates in the direction of the arrow F, in which channel a conveyor screw is shown diagrammatically. In such an embodiment, a urine collection channel 7 is assigned to the return roller 3, and, as is discernible from the representation in Fig. 1, with this embodiment the last end of the base 8 is inclined slightly, so that the urine conveyed to this end by the lower belt half 5 flows by itself to the urine collection channel 7.

The walls 10 and 11 are made of concrete, whereby these concrete strips are limited by wall elements 28. Each wall element 28 comprises a vertical wall 12, a roof part 15 and a base part 14, whereby the roof part of the wall element 28 directed towards the trough interior is inclined towards the trough interior from the top downwards. The outer wall element 28 also supports such a roof part 15, but it is inclined outwards. Eyelets 16 are provided on the inside of the vertical walls 12, which eyelets accommodate the interconnecting bars 19 that connect the wall elements 28 to one another in their longitudinal direction. In the transverse direction the wall elements 28 are connected to one another by perforated sheet metal elements 17 so that a "stable mold" is created for the concrete to be poured. Furthermore, bearing shafts 20 traverse both the wall elements 28 and the concrete strips on which the upper belt half 4 of the manure conveyor belt 1 rests.

The operation of this manure conveyor belt 1 is such that both return rollers 2 and 3 are driven via the electric motors 26 and 27. The motor 26 hereby sometimes runs more quickly than the motor 27 and after a certain time interval

and a stoppage time, this drive is switched over so that then the motor 26 runs more slowly and the motor 27 more quickly. Despite these different rotational speeds – of either the one or the other motor – the belt circulates in the same direction and always at the speed of the motor running more slowly.

However, the belt is not driven constantly, but, for example, after a period of 1- 4 minutes both motors are stopped and only started up again after a time to be regulated individually. Through this the relatively solid manure resting on the upper belt half 4 has sufficient time to drain and also to already dry in advance. The lower belt half 5 is immersed in the urine collecting there and, since the actual manure conveyor belt 1 is a perforated plastic belt, this perforated plastic belt now conveys the urine to the urine collection channel 7, while at the same time the solid manure is transferred to the manure collection channel 6 and is conveyed away from there.